

Appendix A

Outcomes instruments used in the clinical evidence for arthroscopy for the osteoarthritic knee

Scale	Description	Validity	Reliability
American Academy of Orthopaedic Surgeons (AAOS) Lower Limb Outcomes Instrument*	<ul style="list-style-type: none"> • Site specific instrument • General pain and disability of lower limbs, with specificity for knee problems and documentation for joint replacement • Lower limb: 29 items, 6 scale + 6 individual items • Hip and Knee: 8 items, 2 scales 	X	X
AAOS Hip and Knee Outcomes Support Instruments*	<ul style="list-style-type: none"> • Site specific instrument • General pain and disability associated with knee, with documentation for joint replacement • Core disability scale, 7 items • Right and left knee pain scales, 3 items each 		X
Ahlback scale	<ul style="list-style-type: none"> • Classification system • Grading of radiographic findings • Grade I: \geq slight reduction of the cartilage height; Grade II: obliteration of the joint space; Grade III: bone loss of ≥ 7mm measured along the medial or lateral margins of the joint from a line perpendicular to the axis of the tibia and tangential to the unaffected articular surface; Grade IV: bone loss of > 7mm measured as above; Grade V: bone loss > 7mm with subluxation 		
Arthritis Impact Measurement Scales (AIMS-2)*	<ul style="list-style-type: none"> • Disease specific instrument • Health status questionnaire to assess function, work, social support, and problems due to arthritis • 78 items, 12 scales 	X	X
Arthritis Self-Efficacy Scale (ASES)*	<ul style="list-style-type: none"> • Disease specific instrument • Patient's perceived self-efficacy to cope with chronic arthritis • Subscale for pain, function, and other symptoms 	X	X
Arthritis Impact Measurement Walking and Bending subscale (AIMS2-WB)	<ul style="list-style-type: none"> • Disease specific instrument • Five item walking-bending subscale from AIM-2 • Scores 0-100; \geq limited fxn 	X	X
Arthritis-specific SF-36 (ASHI)*	<ul style="list-style-type: none"> • Disease specific instrument • Applies arthritis-specific scoring algorithm to the SF-36 to improve responsiveness of instrument to changes in arthritis severity • 2 summary measures, 8 subscales 	X	X
Duke Arthroscopy Score	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Pain and function pre- and post-operatively • Numerical rating system from 0-60 • 0=no change; 1-20 fair result; 21-40= good result; 41-60 excellent result 		

EuroQol or EQ-5D Index*	<ul style="list-style-type: none"> • General health assessment • General health status • 16 blocks of items in 5 scales, 2 single item scales, visual analog 1-100 scale, self-rating 	X	X
Functional Assessment Scale*	<ul style="list-style-type: none"> • Disease specific instrument • Standard balance in adults with osteoarthritis 		X
Functional Status Index (FSI)*	<ul style="list-style-type: none"> • General health assessment • Performance, i.e. level of function • 3 multi-item scales, 6 single item questions 	X	X
Health Assessment Questionnaire (HAQ)*	<ul style="list-style-type: none"> • Disease specific instrument • Self-reported functional status • 27 items for illness plus medical history 	X	X
Hospital for Special Surgery Knee Score (HSS)	<ul style="list-style-type: none"> • Disease specific instrument • Scale for pain and functioning • Higher score= >pain and < functioning 	X	
Kettlekamp Knee Scoring Scale*	<ul style="list-style-type: none"> • Disease specific instrument • Pain and functional disability • Possible scores 0-103, Higher score = < pain & > functioning 	X	
Knee Injury and Osteoarthritis Outcome Score (KOOS)*	<ul style="list-style-type: none"> • Disease specific instrument • Pain and associated problems with daily activities • 42 items, 5 subscales 	X	X
Knee Society Clinical Rating System (AKS)*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Knee joint and functional score for patient's ability to walk and climb stairs taking into account aging and declining condition • 11 categories, 100 pt scale 		X
Knee Society Index of Severity for Failed Total Knee Arthroplasty*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Linear model to facilitate physician judgment of severity of prognostic factors related to knee revision surgery. • Decision modeling 	X	X
Knee-Specific Pain Scale (KSPS)	<ul style="list-style-type: none"> • Site specific instrument • Measures knee pain • 12-item self-report; 0-100, high = pain 		X
Lequesne Index of Severity for OA of the Knee (ISOA Knee)*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Severity index for knee diseases for the OA knee. • 11 items, scores 0-24, Higher score = > handicap 	X	
Lysholm scale	<ul style="list-style-type: none"> • Site specific instrument • Measure of functioning • Maximum score = 100; modified version used in Hubbard (1996) max = 70. 	X	
Osteoarthritis Global Index (OGI 8.0)*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Benefits of therapy and outcome of treatment • 8 items, 3 scales 		

Outerbridge	<ul style="list-style-type: none"> • Classification system • Severity of articular degeneration by compartment • Grades I to IV; (Grade I: softening or blistering of the articular cartilage; Grade II: fragmentation or fissuring in an area <1cm; Grade III: fragmentation or fissuring in an area >1cm; Grade IV: cartilage erosion down to the bone) 		
Oxford Knee Score (Oxford-12)*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Outcome and functional change following total knee replacement • 12 item, single scale 	X	X
Physical Functioning Scale (PFS)	<ul style="list-style-type: none"> • General health assessment • Objective measure of functioning • Seconds to walk 30m, climb up/down flight of stairs; • >time=<fxn 		X
Postoperative Knee Score for Pain	<ul style="list-style-type: none"> • Site specific instrument • Pain, function, and range of motion • Score 3-12 (3-5 points = poor, 6-8 points = fair, 9 or 10 points = good, and 11 or 12 points = excellent) 		
Medical Outcomes Study 36-item Short-Form General Health Survey (SF-36)*	<ul style="list-style-type: none"> • General health assessment • Effects that could be direct function of disease and treatment • Ten item physical-function subscale from SF-36, >score => functioning 	X	X
Medical Outcomes Study 36-item Short-Form General Health Survey for pain (SF-36-P)	<ul style="list-style-type: none"> • General health assessment • Body pain • 2-items pain subscale from SF-36 • Scores 0-100;>score =< pain 	X	X
Visual Analog Scale (VAS)	<ul style="list-style-type: none"> • General health assessment • Severity of pain • 10 cm horizontal scale 	X	X
SMFA: Musculoskeletal Function Assessment/ Short Form*	<ul style="list-style-type: none"> • General health assessment • General functional ability for patients with musculoskeletal conditions • Composite function scale of 34 daily living items, 4 focused activity scales and a “bother” scale 		X
Subjective Knee Score*	<ul style="list-style-type: none"> • Site specific instrument • General knee functioning during activities and a visual analog overall knee score • Maximum score of 110 	X	
Western Ontario & Mc Master Universities Osteoarthritis Index (WOMAC)*	<ul style="list-style-type: none"> • Arthroplasty outcome indices • Clinically important changes in health status after surgical intervention • 24 items in 5-point Likert and 100mm visual analog format 	X	X

*Description found in American Academy of Orthopaedic Surgeons (AAOS) (2002), *Improving Musculoskeletal Care in America (IMCA) Project: Osteoarthritis of the Knee*, Chicago, Report.

Appendix B

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Dervin, et al, 2003	<p>Prospective case study with 2 independent evaluators.</p> <p>To develop a prediction rule with use of common clinical criteria to define which patients with symptomatic osteoarthritis should be offered arthroscopic debridement resulting in sustainable improvement in health-related quality of life</p>	<p>All patients had arthroscopic debridement, which included resection of unstable chondral flaps and meniscal tears. It did not include abrasion.</p> <p>All patients assessed by 2 independent groups of surgeons, evaluated preoperatively using standardized assessment of clinical symptoms and signs and plain xray</p> <p>Primary outcome: Pain</p> <p>Outcome measures: WOMAC and SF-36</p> <p>Quality of life by self- administered instruments assessed preoperatively and postoperatively at 6,12,24 months.</p> <p>Success if improvement in score >20%</p>	<p>N=126 patients (156 referred, 126 entered)</p> <p>Age: 40-75, mean 61.7</p> <p>Sex: 67 female 59 male</p> <p>All patients failing medical management of knee OA were referred.</p> <p>Exclusion: inflammatory or traumatic OA</p> <p>Medical management included: oral or topical analgesics, NSAIDS, and intra-articular injection of hyaluronate and/or cortisone</p>	<p>56% (n=44) clinical reduction in pain per WOMAC at 2 years</p> <p>MDs were poor at predicting which pts would improve with arthroscopy.</p> <p>Inter-rater reliability: kappa = 0.27</p> <p>Factors associated with improvement: *medial joint-line tenderness (p=0.01) *positive Steinman Test (p=0.01) *unstable meniscal tear at arthroscopy (p=0.01)</p> <p>Unstable meniscal tear was the only variable associated with improvement in all 3 WOMAC subscales</p> <p>Giving way and locking were poor discriminators for outcome and seen in <50% of the</p>	<p>The mechanical symptoms of giving-way and locking were especially poor discriminators and were seen in less than ½ the patients.</p> <p>The inter-rater reliability was poor in predicting which patients would have sustained improvement post arthroscopy.</p> <p>Did not compare to placebo</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
				patient population.	
Fond, et al, 2002	<p>Case series, retrospective chart review.</p> <p>To asses whether arthroscopic debridement of a degenerative knee improves patient satisfaction and function.</p>	<p>Pts scoped by same surgeon.</p> <p>Debridement included: Debridement of meniscal lesions, limited thermal stabilization of chondral defects, removal of impinging tibial, subpatellar & notch osteophytes, partial synovectomy, and lateral retinacular release.</p> <p>Charts reviewed.</p> <p>Pre-op symptoms classified into mechanical (local pain and tenderness, giving way, locking) or loading symptoms (pain with weight bearing, poorly localized pain)</p> <p>Primary outcome: Modified HSS scoring scale used for pre-op and post -op symptoms.</p>	<p>N=36 pts with f/u at 2 and 5 years</p> <p>Mean age: 65 years</p> <p>Mean duration of symptoms: 60 months</p> <p>Selection criteria: All pts undergoing arthroscopy for OA and available for f/u</p> <p>Exclusion: major malalignment (not defined)</p>	<p>Mean pre-op HSS score=29.2, Mean post-op @ 2 years=48 Mean post-op @ 5 years=43.2</p> <p>Results correlated with pre-op range of motion.</p> <p>Poor outcomes associated with longer duration of symptom, tricompartment disease, low mean pre-op HSS scores, and > 10 degrees of extension deficit pre-op.</p>	<p>No data tables given.</p> <p>No results of regressions shown.</p> <p>Many pts had TKR recommended before they entered this trial.</p> <p>Malalignment not defined</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Moseley et al, 2002	Masked placebo-control RCT To evaluate the efficacy of arthroscopic surgery of the knee in relieving pain and improving function in pts with osteoarthritis (OA)	3 arms: Placebo surgery (control) vs. debridement vs. lavage Debridement included: Chondroplasty, loose body removal, trimming torn/degraded meniscal fragments, meniscus smoothed to firm, stable rim. Lavage: at least 10 L of fluid Placebo: simulated debridement surgery: pts prepped and draped, tranquilizers and opioids used to sedate, 3 1-inch incisions made Primary: Pain in knee at 24 months assessed by KSPS Secondary: AIMS2-P, SF-36-P, AIMS2-WB, SF-36-PE, PFS. Results stratified by severity	N=180pts (144/324 declined) 60 in each arm Mean age: 52.3 SD 11.3 3 groups had 88.5-96.6% male Selection criteria: Eligible if 75 or less, OA of knee defined by American College of Rheumatology (ACR), moderate knee pain despite maximal medical Tx x 6mo, no arthroscopy in last 2 years Exclusion: severity grade >9, severe deformity, serious medical problems	No difference in pain relief or function between placebo and txt groups KSPS @ 1 year: Placebo 48.9 Lavage 54.8 Debridement 51.7 AIMS @ 1 year: Placebo 54 Lavage 57 Debridement 55	Possible selection bias (44% refused participation) Primary endpoint assessed with unvalidated instrument VA sample of all men
Wai et al, 2002	Retrospective To evaluate patterns of arthroscopic knee debridement use & outcomes following procedure for treatment of degenerative arthritis in	Secondary data analysis Primary outcome: receipt of elective debridement and rate of TKR Secondary outcome: pt-specific factors of outcomes following	N=14,391 unilateral knees. Mean age: 62.4 7181 women 7210 men 13,743 no comorbidity Inclusion: All Ontario users >=50	1330 TKR w/in 1 yr post 1146 TKR w/in 3 yrs post TKR increases with age Higher rates of arthroscopy associated with higher rates of	Canadian study Study does not address efficacy of procedure. Possible placebo effect

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
	arthritis in people > 50 years of age in the province of Ontario, Canada	following debridement	Ontario users >=50 w/ elective arthroscopic knee debridement btw 92-96, from 16 district hospitals Exclusion: inflammatory arthritis, RA, same day bilateral knee operations w/ L&D	higher rates of early TKR if pts >=60 years of age 478 repeat debridement & lavage w/in 3 yrs 274 pts. had documented complications.	
Shannon et al, 2001	Retrospective, case series To determine the results of arthroscopic lavage with limited joint debridement in pts with symptoms of mild-moderate osteoarthritis of the knee and establish the duration of symptom relief.	Debridement included: removal of loose bodies, partial meniscal resection F/u 4-year period based on 1 mo post-op visit Primary outcome: symptom relief post lavage & debridement Secondary outcome: identification of pre-op variables predicting outcome Duke arthroscopy score used to assess pain and function pre/post op.	N = 54 (55 knees) 30 women 24 men Mean age: 61 years Mean f/u 29.6 mo Inclusion: all pts with OA, failed conservative treatment, symptoms greater than clinical/xray findings, but not severe enough for TKR. Exclusion: Diagnosed meniscal tear/loose body	37 cases improved (26 good/ excellent and 11 fair) 18 cases had no change Avg. duration pain relief: 25.5 mo 85% with Outerbridge. I, II improved 57% with Outerbridge. III, IV improved	Incidental findings of meniscal tears and small loose bodies are not unusual. Possible placebo effect Small sample size
Kalunian et al, 2000	Multi center RCT, double blind To determine whether full volume saline lavage vs. minimal volume lavage changes clinical and functional outcomes in pts	Full volume lavage: 3000 ml saline Minimal lavage: 250 ml saline Primary: change in aggregate WOMAC score Secondary: change in WOMAC subscore for pain	N=90; 41 full vol irrigation, 49 minimal Pts with full vol irrigation had more swelling at baseline Inclusion: >40 yr, knee pain for <=10yrs, unsatisfactory pain relief despite PT	No change in aggregate WOMAC score Change in WOMAC subscore for pain and VAS for pain only.	No reference to mechanical symptoms Surgeons not blinded Most changes not statistically significant

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
	with early knee osteoarthritis	and in pain VAS.	and meds, minimally abnl xray (Kellgren/Lawrence grades 0-2, meet ACR criteria for OA.) Exclusion: BMI>35, other joint disease, recent steroid injection, others		
Harwin, 1999	Retrospective, case series of one orthopedic surgeon To identify predictors of patient satisfaction associated with patient selection for arthroscopic knee debridement	“Standard” arthroscopic debridement*, plus post-op ROM and strengthening exercises, supervised physical therapy and various NSAIDS Three groups based on degree of varus or valgus alignment on standing AP xrays: Grp I: 0° c nl joint space Grp II: ≤5° c narrowed joint Grp III: >5° c more severely narrowed joint space Primary outcome: % satisfaction rated by the pt’s self-reported post-op assessment of: “Are you better, unchanged or worse” Secondary: Pre and post-op HSS knee scores	220 pts selected from total of 2730 pts who had knee arthroscopy, of which 30/220 pts lost to follow-up N = 204 knees (from the remaining 190 pts who were actually followed & reported) * Grp I: 57 knees * Grp II: 102 knees * Grp III: 45 knees 109 women, 81 men Mean age: 62.1 yrs (32-88) Mean follow-up: 7.4 yrs (ranging from 2-15 yrs) Selection criteria: From all pts with knee arthroscopy between 1980 and 1993, retrospective chart review performed for the subset of pts found to have areas of fibrillated cartilage with exposed bone who underwent arthroscopic knee debridement	Percent of knees reported by pts at mean of 7.4 yrs after AD: * Grp I: 84.2 – better; 12.3 - unchanged; 3.5-worse * Grp II: 67.6 – better; 23.5 - unchanged ; 8.9-worse * Grp III: 26.7 – better; 26.7- unchanged; 46.6-worse * All knees (n=204): 63.2 – better; 21.1- unchanged; 15.7-worse Secondary: Mean change in pre-op and post-op HSS knee scores not significantly different for those pts who were either better or unchanged post-op, versus those pts who were worse post-op	Wide range of follow-up Process of assessing outcomes unclear Questionable validity of primary outcome measure Potential wide variability in treatment intervention

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
McGinley et al, 1999	Retrospective case/chart review of cases from one surgeon To determine long term results of debridement and lavage	Debridement included: meniscal tear resection, nonaggressive shaving of frayed articular cartilage, drilling of medial femoral condyle, loose body removal, lateral release Primary outcome: satisfaction (scale 0-10; 10="completely satisfied"), return to functioning, delay/avoid TKR Assessments made 10 years after intervention	N=77pts (91/191 knees) Mean age: 62.6 (55-82) Inclusion: Pts chose D&L over TKR, Outerbridge grade 4 in at least 1 compartment	TKR in 30/90 knees Average time to TKR =6.7 yrs. Mean pt satisfaction: 8.6	Unvalidated scale used to assess satisfaction and no example of questions from survey/scale
Ravaud et al, 1999	Multicenter, prospective RCT of 6 month duration at 6 sites in France To evaluate efficacy of joint lavage and intra-articular steroid injection, alone and in combination, in pts with symptomatic knee OA	4 Treatment groups: * Intra-artic placebo (IA-P) * Intra-artic steroid (IA-S) * IA-P plus joint lavage(JL) * IA-S plus joint lavage(JL) Primary outcome: % change in severity of pain evaluated on visual analog scale (VAS) from baseline to week 24 "Clinically relevant improvement" defined as >30% change in VAS	98/128 eligible pts were randomized and 93/98 pts treated as allocated N = 93 pts * 26 pts for IA-P * 23 pts for IA-S * 21 pts IA-P plus JL * 23 pts IA-S plus JL 66 women, 32 men Mean age ranged from 63-67 yrs in the 4 treatment groups	Pts with joint lavage had sig. improved pain VAS scores at wk 24 versus pts with placebo (p=0.02). % with clinically relevant change in pain @ wk 24: VAS (placebo 2%) Lavage 36%; p=0.02 Steroid 21%; p=0.31 Lequesnes (% change from baseline at 24-wks) Lavage 21%; p=0.857 Steroid 20%; p=0.863	30/128 eligible pts not randomized 23/98 of randomized pts withdrew due to ineffective procedure (19) or were lost to follow-up (4) Twice as many withdrawals in IA-placebo group (10/28) as in other groups

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Linschoten et al, 1997	Case series To determine which factors influence the outcome of arthroscopic debridement.	Preliminary diagnostic arthroscopy followed by arthroscopic debridement individualized according to the findings in each case Primary outcome: Self-reported "Good" outcome defined as: * symptomatic improvement * activity level equal to or better than before arthroscopy * satisfaction with procedure * willingness to do procedure again Poor outcome defined as: * any outcome falling short of criteria for good outcome * a good outcome that deteriorated within 24 months post-procedure * any subsequent surgery on the same knee	Retrospectively selected from 68 knees in 67 pts meeting from chart review of 169 pts who had knee arthroscopy from July 1985 to January 1988 N = 56 knees (in 55 pts) 27 men, 28 women Mean age: 62.5 yrs (41-79) Mean f/u: 49 months (24 - 67) Inclusion criteria: * >40 years * pre-op diagnosis of OA or rheumatoid arthritis with associated degenerative changes * failure to respond to conservative therapy * arthroscopically confirmed degenerative changes Exclusion criteria: * arthroscopy for traumatic tears of meniscus or cruciate ligament * preliminary diagnosis of degenerative arthritis not corroborated by subsequent arthroscopy	38/56 (68%) "good" outcomes 18/56 (32%) "poor" outcomes Likelihood of successful outcome said to be "significantly and directly related to the condition of the articular cartilage." Loss of cartilage down to the bare bone and medial compartment involvement associated with poor outcome No sig. relationship between the procedural outcome and the presence of meniscal tears, loose bodies or fat pad abnormalities Axial alignment was able to be determined in 33/55 pts: * In 20/33 pts with satisfactory alignment ($\leq 4^\circ$ tibiofemoral angulation), 15/20 (75%) obtained "good" outcomes	Non-validated outcome measure Potential wide variability in treatment intervention 7 of 56 knees (12.5%) in patients with rheumatoid arthritis

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
				* In 13/33 pts with varus-valgus malalignment (> 4° angulation), 7/13 (54%) had “good” outcomes	
Hubbard 1996	Prospective, unmasked RCT To compare arthroscopic debridement with washout in pts with clearly defined levels of degeneration of the articular cartilage of the medial femoral condyle	Control= washout group. 3 L saline Debridement-resection of loose cartilage. No meniscectomy performed Primary outcome: pain and symptom relief. Lysholm score used, modified to exclude stability score, maximum score =70 Recorded as success or failure denoting the absence or presence of pain	76 knees: 40 debridement 36 washout (aka lavage) Mean f/u for 58 knees was 4.5 yrs (all original 76 followed for 1 year) Inclusions: all pts w/ arthroscopic surgery for degeneration of articular cartilage of the knee. All with unremitting symptoms in knee for 1 yr prior. Excluded: knees with any additional intra-articular pathology beyond medial femoral condyle Outerbridge Grade III or IV.	* 1 yr: 32 debridement and 5 washout pain free * 5yr: 19 debridement and 3 washout pain free. Mean improvement by modified Lysholm: 28 for debridement @ 1 yr; 21 @ 5 yr. Sig. diff btw debridement & lavage groups	Debridement limited limited to medial femoral condyle grade 3 or 4 Outerbridge. Might be useful for minimal arthritic changes without meniscal changes.
Yang et al 1995	Retrospective chart review of arthroscopic surgery performed by one surgeon from July '89 to July '93 To determine success of arthroscopy measured by	Intervention: Knee arthroscopy, to include some of the following: lavage to remove intra-articular debris and loose bodies, debridement of cartilaginous defects and unstable flaps, drilling of	N=103 pts with 105 knees (selected from “greater than 1000” arthroscopic procedures of knee) 20 women, 83 men Mean age: 64.2 yrs (60-81) Mean follow-up: 11.7 months	Outcomes of post-op knee pain score: * 21 (20%) excellent knees * 47 (44.8%) good * 34 (32.4%) fair * 3 (2.9%) poor Good and	Short follow-up Non-uniform arthroscopic intervention, with probable wide variability in treatment No published reference or validation of 12 point post-op

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
	standard scoring system, and correlate preoperative and intraoperative findings with outcomes	chondral defects, and synovectomies No meniscal repairs or abrasion arthroplasties were performed. Primary outcome: 12-pt post-op knee score for pain, function and ROM, ranging from 3-5 points for poor to 11-12 points for excellent	(ranging from 6-60 months)	excellent knees (64.8%) considered surgical successes The most significant predictors of good outcomes were preoperative mechanical symptoms, (i.e., those resulting from loose bodies or flap meniscal tears; only mild articular degeneration visible at arthroscopy)	knee score utilized as study's primary outcome measure
Chang et al 1993	RCT at two sites To compare arthroscopic surgery and closed-needle joint lavage in pts with non-end-stage OA	Intervention: meniscal debridement; removal of proliferative; synovium; excision of loose cartilaginous fragments; continuous saline lavage. Control group: only tidal lavage (1 L) Both groups additionally received PT and only non-narcotic analgesia Primary outcomes evaluated at baseline, 3 and 12 months: * Knee range of motion * Knee joint swelling	N = 32/200 pts randomized 18 pts received arthroscopic surgery: * 13 women, 5 men * Mean: 61 yrs 14 pts received joint lavage: * 10 women, 4 men * Mean: 65 yrs Inclusion criteria: Persistent knee pain for longer than 3 mo despite conservative medical and rehab management restricting activities to a level unacceptable to patient Exclusion criteria: Knee surgery	No sig. difference in any of the clinical, functional or global outcomes between the arthroscopic surgery group and the non-operative lavage control group at 3 months Sig. changes in only 2 of the 10 primary outcomes. The only cartilage, bone or soft tissue abnormalities possibly associated with successful arthroscopic surgery were	Possible selection bias: 90 pts "retrospectively" fulfilled entry criteria and "about 45" of the 90 had surgery outside of the study In discussion, the authors noted the following: * Improvement in arthroscopic group increased by tx of tear of lat meniscus or anterior 2/3 of medial meniscus * Study couldn't address whether arthroscopic surgery more effective for this

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		<ul style="list-style-type: none"> * Knee joint tenderness * Pt self-reported pain * AIMS-2 * 50 foot walk time * Pt overall well being * Doctor's global assessment * Direct medical costs * Indirect medical costs 	within 6 months of study, or class 4 xray findings	<p>tears of the anterior 2/3 of the medial meniscus or any lateral meniscal tear</p> <p>Radiologic class did not correlate with outcome, and none of the clinical signs or symptoms collected (including locking, giving way or positive McMurray's sign) predicted the presence or absence of meniscal pathology</p>	<p>subgroup of pts</p> <ul style="list-style-type: none"> * Unable to determine pre-op intra-articular pathology in patients randomized to lavage * Pts with meniscal findings couldn't be identified pre-op by any set of clinical sign or sx's

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Merchan, et al, 1993	Prospective, randomized To determine relative benefit of limited debridement with partial menisectomy.	Intervention: limited debridement with partial Debridement included resection of synovial tissue; removal of degenerative menisci, osteophytes, and loose bodies; and limited debridement of cartilage defects. Control: no procedure (non operative group). All had PT. Non-operative group had NSAIDS and a decrease in intensity of activities affecting the painful knee Primary outcome: HSS Knee Rating Score. Success= increase in the post-op score of at least 10 pts. Failure=score decreasing or failing to increase by 10 points.	Knee score difference greater in arthroscope group. 85% improved post operation at 1 year. 63% of the non-operative group improved at 1 year.	Author believe main indication for scope is for treatment of other problems that coexist with OA, commonly meniscal tear. Relationship between OA severity and functional results post-debridement is not clear.	

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Bonamo, et al 1992	<p>Retrospective case-control, unmatched</p> <p>Determination of prognostic factors for pts over 40 undergoing arthroscopic partial menisectomy and limited debridement of coexisting degenerative articular surface erosion. Control group did not have clinically significant articular degeneration.</p>	<p>Pts had limited debridement with partial menisectomy.</p> <p>Procedure included: partial menisectomy, loose body removal, limited debridement of articular surface</p>	<p>N=181 (246 entered, 181 completed f/u questionnaire).</p> <p>Pts further divided into 2 groups related to severity of Outerbridge</p> <p>Less severe Group I (Outerbridge I&II), N=63</p> <p>More severe Group II (Outerbridge III&IV), N=118</p> <p>Group II had mechanical symptoms.</p> <p>Both groups had 2-5% of pts with malalignment</p> <p>Inclusion: symptomatic, arthroscopically verified meniscal tear unresponsive to conservative treatment (not defined),</p> <p>Exclusion: previous knee surg, ligament deficiency, systemic arthritis, osteonecrosis, chronic functional disability of any kind.</p>	<p>Group I had greater pt satisfaction (94% (N=59)) than more severe Group II (70% N=82).</p> <p>No relationship between malalignment and outcome.</p> <p>Pts in Group II with more significant arthritis had poorer results.</p> <p>Women had poorer outcomes</p>	<p>Un-matched</p> <p>Subjective improvement measures</p>
Gibson et al, 1992	<p>Randomized treatment study.</p> <p>To evaluate the effect of arthroscopic lavage and debridement of the osteoarthritic knee.</p>	<p>Lavage vs debridement with osteophyte removal.</p> <p>Debridement included: Excision of loose articular cartilage, degraded margins</p>	<p>N=20</p> <p>Age: 38-69</p> <p>Selection criteria: Pts in orthopedic practice.</p> <p>Symptoms scored with British</p>	<p>No significant improvement in muscle strength or function of the affected leg</p>	<p>Limited generalizability because of small sample size.</p> <p>Possible selection bias</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		<p>of medical and lateral menisci smoothed out.</p> <p>Lavage: 1 litre of saline through all compartments of joint.</p> <p>Primary outcome: muscle strength in affected quadriceps compared to non-affected knee.</p> <p>Measured by biopsy and blinded physical therapy evaluation.</p>	<p>Orthopaedic Association Scale as well as a modified Outerbridge Scale.</p> <p>Exclusion: age > 70, >20 degrees varus/valgus deformity</p>		
Katz et al 1992	<p>Retrospective review</p> <p>To identify clinical and demographic factors associated with worse outcomes after arthroscopic partial meniscectomy (APM) using multivariate analysis</p>	<p>Intervention: APM</p> <p>Primary outcome: Functional status as assessed by current postoperative score on the physical activity scale of the SF-36</p> <p>Predictor variables abstracted from hospital records and operative notes, as well telephone questionnaires and interviews:</p> <ul style="list-style-type: none"> * Medical history data including preoperative symptoms, prior knee surgery, extent of comorbidities * Impairment data including clinical examination, radiographic findings and 	<p>N = 105 pts (of 125 pts who underwent APM)</p> <p>14 pts lost to follow-up and 6 refused to participate (of original 125 pts who underwent APM)</p> <p>Number of men & women not reported, but most said to be white males</p> <p>Mean age: 39.5 yrs (SD 13.4)</p> <p>Inclusion criteria: Pts undergoing APM from July 1988 to June 1989, who were over 18 yrs of age at time of surgery</p> <p>Exclusion criteria: Unable to complete interviews in English</p>	<p>Multivariate associations between primary outcome (post-op functional status) and predictor variables:</p> <p>Three predictor variables were independently associated with worse postoperative functional status on SF-36 ($p \leq 0.05$):</p> <ul style="list-style-type: none"> * Worker's compensation ($p = 0.003$) * Pre-op SF-36 physical activity score ($p = 0.007$) * Presence of grade III or IV cartilage damage on Cascells scale ($p = 0.05$) 	<p>Possible patient selection and recall bias</p> <p>Young pts w/ questionable generalizability to Medicare beneficiaries</p> <p>Possible confounders include additional surgical procedures (concomitant ACL repairs), utilization of written xray reports without review of original films, and no reliable info on pre or postop meds and PT</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		functional status abstracted * Pre-op functional status on SF-36 * Knee specific disability * Specific meniscus involved, presence of ACL tear, degenerative or non-degenerative tear, and presence of cartilage damage			
Wouters et al 1992	Retrospective chart and radiograph review, plus personal interview To determine results of arthroscopy and define its role in management of degenerative arthritis of knee, particularly selection of pts for knee arthroscopy	Wide variability of indexed arthroscopic procedures, including meniscectomy with or w/out debridement, debridement of one or more compartments (cmpt) of loose articular cartilage, abrasion arthroplasty and lavage Primary outcome: Length of time pts feel they had relief from symptoms (Good > 2 years) following index procedure Secondary outcome: Extent of pain relief, change in use of pain medications, degree of improvement in activity level, patient satisfaction	N = 371 pts whose pre-op xrays were reviewed (from total of 551 pts treated, of whom 441 available for follow-up & personally interviewed) Mean age: 58 yrs (28 - 92) Mean follow-up: approximately 4 years (ranging from 2 – 9 years) Classification of alignment on pre-op radiographs: * Varus $\leq 0^\circ$ * Normal = 1 - 7° * Valgus > 7°	Results of “Good > 2 years” by radiographic assessment of alignment (N = 371): * 60/98 (61%) varus * 180/231 (78%) normal * 19/42 (45%) valgus Results of “Good > 2 years” by type of procedure (N = 441): * 84/103 (82%) 1 cmpt debridement * 78/135 (58%) 2 cmpt debridement * 18/32 (56%) abrasion arthroplasty * 15/18 (83%) meniscectomy * 102/149 (68%) menisc + debridemt * 1/4 (25%) lavage only “Best results” said to be have been obtained	Descriptive study with no statistical analysis Follow-up and outcomes were subjective Non-uniform arthroscopic intervention, with wide variability in treatments Authors noted indications for each type of treatment and/or procedure were different, and thus unable to compare success rate of various procedures in disease management

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
				after resection of unstable meniscal tear associated with mild degenerative arthritis	
Ogilvie-Harris et al 1991	<p>Mailed patient survey plus retrospective chart and radiograph review from January 1983 to January 1987</p> <p>To identify those pre-operative factors correlating with the success (or failure) of arthroscopic surgery in pts over age 50</p>	<p>Type of procedure performed in each of 57 total pts:</p> <ul style="list-style-type: none"> * 18 menisectomies * 9 menisectomies/one debridement * 4 menisectomies/two debridements * 11 menisectomies/two debridements including tibial defect * 8 tricompartment joint debridements * 2 loose body removals * 3 plica excisions * 2 synovectomies <p>Primary outcome: Patient's belief that his/her knee improved following surgery</p> <p>Secondary outcome: Severity of degenerative change on pre-op radiographs, angulation, bilateral surgery, previous surgery, crepitus, gender, twisting injury, effusion, locking,</p>	<p>N = 57 pts with 64 knees returned completed questionnaires (from a total of 94 pts to whom surveys were mailed)</p> <p>Mean age: 62 yrs (50 - 70)</p> <p>Of 55 pts partially accounted for in Table 1: 34 men, 21 women</p> <p>Mean follow-up: 33 months (ranging from 24 - 52 months)</p>	<p>Percentage of pts who felt they had successful results:</p> <ul style="list-style-type: none"> * 82.8% immediately after rehab * 78.1% at 6 months post-op * 73.5% at 1 year post-op * 65.5% at 2 years post-op * 50.0% at 3 years post-op <p>Pre-operative variables which had beneficial effect on outcome ($p < .05$)</p> <ul style="list-style-type: none"> * Minimal radiographic changes * Duration of pain < 3 months * History of locking * History of twisting injury <p>Regarding alignment & degenerative changes on pre-op</p>	<p>Wide variability in arthroscopic intervention</p> <p>Non-documented validation for subjective outcomes</p> <p>Small sample sizes for subgroup analysis of subjective and scored results for all variables</p> <p>Incomplete tables and unclear description of numerical rating system(s) and statistical analysis</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		duration of pain (months), obesity, litigation		radiographs, arthroscopic procedures were: * “Of benefit” for those pts with reasonable alignment and mild to moderate degenerative changes * “Less effective” for those pts with significant varus or valgus, and advanced degenerative changes	
Baumgaertner, et al 1990	Retrospective case review. To determine the extent and duration of symptomatic relief offered by arthroscopic debridement and identify pts most likely to benefit from debridement.	Pts scoped by same surgeon. Chart reviewers blinded to outcome. Operative treatment included: debridement, synovectomy, osteophyte and loose body removal Results graded on nine-point scale (created by authors) based on pain reduction, functional improvement and overall patient satisfaction. Pts with no change in preoperative symptoms or functional level and the end of the follow-up period	N=49 knees (44 pts) Average age: 63 Pre-op symptoms classified into mechanical (local pain, locking, giving way). Inclusion: primary diagnosis of arthritis, symptoms >6 mo Exclusion: pre-op clinical Dx of meniscal tear or loose bodies, non-debridement arthroscopic procedures, failed conservative treatment (not defined)	41 % excellent results, 11% good, 9% fair. Failure in 33%	Potential confounding including rheumatoid arthritis.

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		=failure.			
Timoney, et al, 1990	<p>Retrospective , case series with prospective follow-up</p> <p>To assess the long-term outcome of arthroscopic surgery in middle-aged and elderly pts with symptomatic OA of the knee who have not responded to conservative treatment.</p>	<p>Arthroscopic treatment included lavage, debridement of degenerative meniscal tears and chondral lesions, and partial synovectomy with osteophyctectomy as indicated.</p> <p>Primary outcome: Pain was scored using the Hospital for Special Surgery Knee Rating score (HSS).</p> <p>Secondary outcome: subjective measure of pain</p>	<p>n=111 Knees , n=108 pts</p> <p>33 female, 75 male</p> <p>Mean age: 58.1(40-81)</p> <p>Mean duration of f/u: 50.6 months</p> <p>Inclusion: All pts over 40 with intraoperative diagnosis of OA</p> <p>Exclusion: inflammatory diseases (RA or infectious) or acute injury.</p>	<p>Mean gain in 11.4 points on the HSS scoring system, significant (decrease in pain), but results degrade over time.</p> <p>Subjective results: 50 “good” (relief of all or most pain, with return to full work or activities as before onset of symptoms), 20 “fair” (bothersome pain, with limited activities but an improvement over preoperative levels), 41 “poor “ (recurrent pain, limited activities, or additional surgeries).</p>	<p>Results degrade over time.</p> <p>Poor outcomes in patients with longer duration of symptoms, medial compartment eburnation, grade II changes (Outerbridge) in articular space, or significant malalignment.</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Dawes et al 1987	<p>Randomized treatment study</p> <p>To compare benefits of joint lavage and simple saline injection in OA of knee</p> <p>No change in meds made during the study</p> <p>Assessment by single observer blinded to treatment at baseline, 1, 4 and 12 weeks</p>	<p>Experimental group: Knee aspiration followed by washout of 2 L of normal saline perfused through joint</p> <p>Control group: Knee aspiration followed by injection of 10cc of normal saline</p> <p>Primary: Walking pain, using 100mm VAS</p> <p>Secondary: Night pain, walking time, morning stiffness, stiffness, knee flexion & circumference, quadriceps bulk, sleep disturbance</p>	<p>N = 20 consecutive pts</p> <p>10 saline washout in experimental group:</p> <p>* 4 women, 6 men</p> <p>* Mean: 57.7 yrs (43-73)</p> <p>* Duration of sx: 3.5 yr (.5-10)</p> <p>10 saline injection in control group:</p> <p>* 8 women, 2 men</p> <p>* Mean: 63.3 yrs (49-83)</p> <p>* Duration of sx: 3.9 yr (1-8)</p>	<p><u>Within</u> groups:</p> <p>* Improvement (especially within the control group) in outcome scores before treatment versus 12 weeks after treatment</p> <p>* Experimental (washout) group showed significant decrease in walking pain, night pain and morning stiffness</p> <p>* Control group showed significant decrease in walking pain, night pain and morning stiffness, as well as decreased walking time and increased knee flexion</p> <p><u>Between</u> groups</p> <p>Initial difference at 1 wk, but by 4 wks no significant difference in pain on walking</p>	<p>Small sample size</p> <p>Selection process not fully described</p> <p>Randomization process not described</p> <p>Limited generalizability to those OA patients <u>without</u> knee joint effusion</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
Eastwood 1985	<p>Review of cases of one surgeon</p> <p>To identify the number and nature of failures in a relatively new procedure</p>	<p>Intervention: Arthroscopic partial menisectomy (APM)</p> <p>Outcomes: Number of pts rated as cured, failures or lost to follow-up</p> <p>“Failure”: Defined as no symptomatic improvement at all or only short-term relief</p>	<p>N = 287 technically successful partial menisectomies (of 291 procedures consecutively attempted between Nov 1979 and Mar 1983)</p> <p>Overall mean age: 28 yrs (16-65)</p> <p>8 pts with severe osteoarthritis (mean age= 49 yrs)</p> <p>Inclusion: Clinical diagnosis of meniscal damage with mechanical symptoms attributable to torn meniscus</p> <p>Exclusion: Unsuccessful arthroscopic menisectomy requiring arthrotomy (4 pts)</p>	<p>Overall findings (287 APM pts)</p> <ul style="list-style-type: none"> * 227 (79%) cured * 37 (13%) failures * 23 (8%) lost to follow-up <p>Findings for those APM pts with both meniscal damage and severe osteoarthritis (8 of 287 pts)</p> <ul style="list-style-type: none"> * 100% pts with severe OA (n=8) were failures <p>Main reasons for failure:</p> <ul style="list-style-type: none"> * Inadequate initial assessment and treatment of meniscal tear * Dual pathology (e.g., osteoarthritis) * Development of second tear in meniscal remnant 	<p>No controls or statistical analysis</p> <p>Small sample size of osteoarthritis subgroup</p>
Rand 1985	<p>Prospective case series.</p> <p>To determine the results of arthroscopic partial menisectomy in pts with OA</p>	<p>Procedure conducted by one surgeon</p> <p>Chart reviewers blinded to outcome.</p> <p>Arthroscopic partial menisectomy for degenerative meniscal tear,</p>	<p>N=96 knees (93 pts)</p> <p>47 Men, 37 Women</p> <p>Mean age= 62 years</p> <p>All pts had pain pre-op.</p> <p>40 pts had mechanical</p>	<p>Subjective results: 73 pts improved by last evaluation.</p> <p>No statistically significant correlation between malalignment and outcome.</p> <p>Osteophytes</p>	<p>Repair of meniscal tear will not change the disease process.</p> <p>Partial menisectomy should be reserved to a specific patient population with specific</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		<p>assessed by exam or questionnaire at 1 mo, 3 mo and 1 yr</p> <p>Symptoms, exam (when available) and subjective impression of the results assessed</p>	<p>symptoms.</p> <p>Malalignment (<5 or > 10 degrees valgus) in 58%</p> <p>Inclusion: Outerbridge grade III or IV chondromalacia. Pts may have had previous drilling or abrasion of bone, steroids.</p> <p>Exclusion: tibial osteotomy, popliteal cyst excision, osteophyte removal, lateral retinacular release</p>	<p>on pre-op radiograph had a negative correlation: only 71% improved vs 90% w/o (p<0.003)</p> <p>Conclusions: useful for pts with degenerative meniscal tear and no OA on radiograph or significant malalignment</p>	<p>indications for the procedure</p>
McBride et al 1984	<p>Retrospective review of four arthroscopic surgeons' records</p> <p>To determine: 1) whether preservation of medial meniscal rim protects joint and inhibits progression of degenerative change; 2) proper treatment for symptomatic degenerative tears; and 3) circumstances in which debridement is indicated.</p>	<p>PMM pts divided into two group:</p> <p>Group I: Non-degenerative tears</p> <p>Group II: Degenerative tears (Degenerative tear defined as multiple fibrillations, fissures or horizontal cleavage within meniscus at time of arthroscopy)</p> <p>Primary: Postoperative questionnaire and changes in functional status (with or without a follow-up clinical exam to evaluate symptoms and signs)</p> <p>Subjective composite results: "Excellent" = No symptoms with</p>	<p>N = 43 pts with 44 knees (35 pts evaluated by clinical follow-up and 8 by questionnaire and phone)</p> <p>Group I: 26 pts with 27 knees</p> <p>Group II: 17 pts with 17 knees</p> <p>35 men, 8 women</p> <p>Mean age: 56.5 yrs (42-72)</p> <p>Mean follow-up for both groups: 2.9 years (2-4.6)</p> <p>Inclusion criteria: Pts more than 40 years old who had arthroscopic partial medial meniscectomy (PMM) between Oct 1977 and May 1979</p>	<p>Subjective results (number of knees):</p> <p>Group I: Non-degenerative tears</p> <p>* 14 (52%) excellent</p> <p>* 12 (44%) good</p> <p>* 11 (4%) fair</p> <p>* 0 poor</p> <p>Group II: Degenerative tears</p> <p>* 2 (12%) excellent</p> <p>* 9 (53%) good</p> <p>* 3 (18%) fair</p> <p>* 3 (18%) poor</p> <p>Subjectively equating combined good and excellent</p>	<p>Likely selection bias. 18/63 lost to follow-up</p> <p>Unclear selection process for surgeons and reviewers</p> <p>Subjective outcomes and results w/o validated instruments</p> <p>Preoperative radiographs only available for 5/63 consecutive patients. Thus unable to determine significance of any radiographic findings, or whether any possible changes might be causally related to meniscectomy</p>

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		activity and no limitations in sports or work-related activity “Good” = Minimal symptoms but no important “Fair” = Frequent pain or generally disabling symptoms “Poor” = Severe symptoms with pain at rest and limitation in walking	Exclusion criteria: Preoperative history of ligament injuries, more than 5 mm displacement (laxity) on mediolateral or anteroposterior stress testing, concomitant lateral meniscectomy, extensive chondral shaving, or	results to mean “satisfactory results”, significantly lower percent of “satisfactory results” ($p < .05$) in Group II (65%) versus Group I (96%)	Lacks clear statistical analysis and explanation of how study conclusions follow from results
Sprague 1981	Case series Determine if debridement and lavage is an effective alternative to maximal medical management of OA and to stave off TKR.	Arthroscopic debridement and lavage by one surgeon Debridement included: meniscal tear excision, articular tissue shaving, osteophytes trimmed, removal of loose bodies, fragments, and debris. Mean f/u 13.6 mo, pts assessed by subjective measures. Good result: pt reports improvement, equally functional or more functional than prior surgery. Fair: some improvement, less, equal or more functional than prior; no noticeable improvement but more functional than prior.	78 knees in 72 pts with OA. 68 knees (62 pts) completed follow up. 27 female, 45 male Age: 24-78 (mean 56) 15 with previous meniscectomy Failed maximal medical treatment. All with OA 81% with at least one meniscal tear 21% loose bodies	Good: 74% (51 pts) Fair: 10% (7) Poor: 16% (11)	Subjective measures

Author/Year	Study Design/Purpose	Intervention/ Outcomes	Demographics	Results	Comments
		Poor: unchanged or worse or needing subsequent surgery.			

Notes:

AIMS-2 - Arthritis Impact Measurement Scales

AIMS2-WB - Arthritis Impact Measurement Scales - Walking and Bending subscale

BMI – Body mass index

D & L – debridement and lavage

F/u – Follow-up

HSS - Hospital for Special Surgery Knee Score

KSPS - Knee-Specific Pain Scale PFS - Physical Functioning Scale

NSAIDS – Non-steroidal anti-inflammatory drugs

OA – Osteoarthritis

Post-op – Postoperative

Pre-op – Preoperative

PT – Physical therapy

Pts – Patients

RCT – Randomized controlled trial

ROM – Range of motion

Sig. - Significant

SF-36 - Ten item physical-function subscale from SF-36

SF-36-P - Medical Outcomes Study 36-item Short-Form General Health Survey

Sx-Symptoms

TKR: Total Knee Replacement

Tx-Treatment

VAS- Visual Analog Scale

WOMAC- Western Ontario & Mc Master Universities Osteoarthritis Index,